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ABSTRACT: The taxonomy and distribution of diplocentrid scorpions occurring in Baja California, Mexico, is studied. The following four diplocentrid species occur in this region: *Didymocentrus caboensis* Stahnke, *Didymocentrus cerralvensis* (Stahnke), *Didymocentrus comondae* (Stahnke), and *Didymocentrus cruzensis* (Stahnke). The previously recognized genus *Bioculus* Stahnke is here considered a junior synonym of the genus *Didymocentrus* Kraepelin and eleven previously recognized species are placed into synonymy. *Bioculus aguajensis* Stahnke, *Bioculus figghoblyni* Stahnke, and *Bioculus parrishi* Stahnke are considered as junior synonyms of *Didymocentrus cerralvensis* (Stahnke). *Bioculus belvederi* Stahnke, *Bioculus danzantiensis* Stahnke, *Bioculus parraensis* Stahnke, *Bioculus santoensis* Stahnke, *Bioculus luteus* Stahnke, and *Bioculus similis* Stahnke are considered as junior synonyms of *Didymocentrus comondae* (Stahnke). *Bioculus lindsayi* Stahnke and *Bioculus prolatio* Stahnke are considered junior synonyms of *Didymocentrus cruzensis* (Stahnke).

INTRODUCTION

Until recently, scorpions belonging to the family Diplocentridae were considered uncommon in western North America. Diplocentrids from Baja California, Mexico, were so uncommon in collections that Hoffmann completely omitted them in his extensive monograph of the scorpions of Mexico (Hoffmann, 1931). However, over the years since the Hoffmann study a small series of diplocentrid scorpions from Baja California began to accumulate in collections. The first study of Baja California diplocentrid scorpions was undertaken by Stahnke, when he examined a modest assemblage of some 20 specimens. From this study he reported 15 species, all of which were considered as previously undescribed (Stahnke, 1968). One of these species was placed in the genus *Didymocentrus*, the other 14 species were placed in a new genus which he named *Bioculus*. Stahnke's work aroused considerable excitement because it indicated that diplocentrid scorpions had a much richer species diversity than had been believed, and that a rather spectacular species radiation must have occurred in Baja California.

As a result of Stahnke's report, a special effort was made to accumulate additional diplocentrid material for further study. The resulting collections were studied for purposes of determining the value of the taxonomic characteristics currently in use, the nature of species variability, the geographic distribution of the Baja California species, and the taxonomic composition of the Baja California fauna. Most of the specimens used in this study are permanently deposited in the research collections of the California Academy of Sciences.

ACKNOWLEDGMENTS

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and to Richard and Elenore Dwyer, who sponsored another expedition to study scorpions of the Gulf of California Islands in 1970 aboard their boat *Sea Quest*. Thanks are due Carolyn Mullinex for technical drawings and to Linda Floyd and J. T. Hjelle for technical assistance. This study was partially supported by the National Science Foundation through Research Grants G.B. 7679 and G.B. 23674 and by the California Academy of Sciences through the use of the research facilities of the Department of Entomology.

Genus *DIDYMOCENTRUS* Kraepelin

(Figures 1-7)

Didymocentrus Kraepelin, 1905, p. 342.
Didymocentrus, Stahnke, 1968, pp. 274-276.
Bioculus Stahnke, 1968, pp. 276-279. New synonym.

DIAGNOSIS (characteristics shared by the Baja California species). Anterior margin of carapace deeply bilobed; two or three pairs of lateral eyes; sternum pentagonal; genital operculum of female with valves fused together; males with exposed genital papillae; lateral terminal lobes on tarsomere II of walking legs absent; tarsomere II spiniform setae formula $\frac{3}{3}\,\frac{3}{3}$, $\frac{4}{4}\,\frac{4}{4}$, $\frac{5}{5}\,\frac{5}{5}$, $\frac{5}{5}\,\frac{5}{5}$ or $\frac{4}{4}\,\frac{4}{4}$, $\frac{5}{5}\,\frac{5}{5}$, $\frac{6}{6}\,\frac{6}{6}$, $\frac{6}{6}\,\frac{6}{6}$ on walking legs 1 to 4 respectively; single exterior pedal spur present. Keels on caudal segments generally obsolete; a large subaculear tooth present. Pedipalps robust; chela densely hirsute, especially on surface of fixed finger and palm. Trichobothriotaxy of pedipalp (total of 48 trichobothria): 3 on humerus, (*d* on or near dorso-exterior keel, *e* ventral to dorso-exterior keel, *i* ventral to dorso-interior keel); 19 on brachium (of which there are three ventrals, 13 on lateral surface, two dorsals with d_2 ventral to dorso-interior keel and one interior trichobothrium located ventral to dorso-interior keel); 26 on chela, distributed as illustrated, with *ib*, *it* and *db* aligned, *it* usually posterior to the line between *ib* and *db*, and with *Dt* on the hand near base of fixed finger (fig. 1). Cheliceral dentition as characterized for *Nebo* (Vachon, 1963, fig. 5).

REMARKS. The main characteristic used by Stahnke (1968) to differentiate *Bioculus* from *Didymocentrus* was the presence of six ocelli (1 pair median, 2 pairs lateral), instead of eight ocelli (1 pair median, 3 pairs lateral). Individuals from adjacent *Didymocentrus* and '*Bioculus*' populations are strikingly similar in gross morphology, degree of punctation, coloration, distribution of trichobothria, and size proportions of structural parts. It is apparent from a study of the morphology and geographic distribution of the Baja California fauna that the *Didymocentrus* and *Bioculus* species are derived from the same basic line of scorpions. It does not seem logical to separate this small related group of species into two genera based on the presence of three versus two pairs of lateral ocelli.

A problem exists in understanding the relationship between the genera *Didymocentrus* and *Diplocentrus*. These genera are currently distinguished by the presence or absence of lateral lobe-like terminations on the distal tarsomere of the walking legs. All of the Baja California species in the Diplocentridae lack these lateral lobes and would, therefore, readily be placed into the genus *Didymocentrus*. However, on the east side of the Gulf of California some diplocentrids are not distinctly with or without these 'characteristic' lateral lobes. Further study might, therefore, reveal it appropriate to unite the species of *Didymocentrus* and *Diplocentrus* within the same genus. The close relationship between *Didymocentrus* and *Diplocentrus* can be appreciated by comparing the morphological structures illustrated in figures 2-8. Based on lack of lateral terminal lobes on the distal tarsomeres and similarity of the denticles arming the pedipalp fingers, the Baja California diplocentrids appear to conform more closely to the definition of *Didymocentrus*, as exemplified by *Didymocentrus antillanus* (Pocock), than to the definition of *Diplocentrus*, as exemplified by *Diplocentrus bigbendensis* Stahnke.

Didymocentrus caboensis Stahnke.
(Figures 9, 13, 14.)

Didymocentrus caboensis Stahnke, 1968, pp. 274-276.

DIAGNOSIS. Three pairs of lateral eyes distinguish this species from others of the genus from Baja California; spiniform setae on tarsomere II of walking legs 1 to 4 respectively number: $\frac{3\ 3}{3\ 3}$, $\frac{4\ 4}{4\ 4}$, $\frac{5\ 5}{5\ 5}$, $\frac{5\ 5}{5\ 5}$; pectine teeth more numerous than on other members of the genus from Baja California, 11 to 13 in males, 9 to 11 in females, (modes 12 in males, 10 in females). Most metasomal keels reduced to obsolete, dorsal keels reduced to a few low granules; segment I with dorsolateral keels as a row of granules, on other segments not as well developed; inferior lateral and inferior median keels of segments I and II keeled as distinct lines, other segments with few granules or with obsolete keels; metasomal segment V with inferior lateral keels developed as indistinct lines of coarse granules, inferior median keel present as incomplete line of a few coarse granules; fifth metasomal segment distinguished from those of other Baja California species by the slightly more hirsute dorsum; caudal segment length to width proportions in adult males, I - 0.94 to 1.1, II - 1.1 to 1.4, III - 1.2 to 1.4, IV - 1.5 to 1.8, V - 2.1 to 2.6; in females, proportions generally stouter than males.

This species appears most like *Didymocentrus comondae* (Stahnke), from which it is distinguished by the presence of three pairs of lateral eyes.

TYPE DATA. Holotype, female, San Jose del Cabo, Baja California Sur, Mexico, collected before 1950. Permanently deposited in the Museum of Comparative Zoology, Harvard University.

GEOGRAPHIC DISTRIBUTION. Occurs in the Cape region of Baja California Sur from near San Antonio south to the tip of the peninsula at Cabo San Lucas (23°48' to 22°51' N.).

RECORDS. Known from 22 localities in BAJA CALIFORNIA SUR, MEXICO: 6.8 mi. NE. San Antonio, 24 July 1968, S. C. Williams, M. M. Bentzien, 2 females (CAS); 0.5 mi. E. of San Bartolo, 24 July 1968, S. C. Williams, M. M. Bentzien, 2 males (CAS); La Ribera, 10 February 1966, V. Roth, 1 male, 2 females (AMNH); Bahia de los Frailes, 8 March 1947, I. LaRivers, 1 male, 1 female (UCB); Boca de la Sierra, 10 February 1966, V. Roth, 3 females (AMNH); 2 mi. SE. Boca de la Sierra, 8 May 1969, S. C. Williams, 2 females (CAS); 3 mi. S. Boca de la Sierra, 8 May 1969, S. C. Williams, 1 male, 1 female (CAS); 17 mi. N. San Jose del Cabo, 9 February 1966, V. Roth, 1 female (AMNH); 1.5 mi. NE. Punta Palmilla, 16 July 1968, S. C. Williams, M. A. Cazier, and party, 63 males, 7 females (CAS); 1.5 mi. NE. Punta Palmilla, 17 July 1968, S. C. Williams, M. A. Cazier, and party, 6 males, 1 female (CAS); 3.5 mi. SW. Punta Palmilla, 17 July 1968, S. C. Williams, M. A. Cazier, and party, 2 males (CAS); 3.9 mi. SW. Punta Palmilla, 17 July 1968, S. C. Williams, M. A. Cazier, and party, 1 male (CAS); 11 mi. W. Punta Palmilla, 9 May 1969, S. C. Williams, 1 female (CAS); 9 mi. S. Todos Santos, 14 January 1959, H. B. Leech, 1 male (CAS); 3.5 mi. S. El Pescadero, 23 July 1968, S. C. Williams, M. A. Cazier, and party, 7 males, 6 females (CAS); 4 mi. N. La Tinaja, 23 July 1968, S. C. Williams, W. K. Fox, M. M. Bentzien, 2 males (CAS); 2 mi. NW. Los Pozos, 23 July 1968, S. C. Williams, W. K. Fox, M. M. Bentzien, 2 females (CAS); 12 mi. NE. Cabo San Lucas, 7 February 1966, V. Roth, 2 males, 1 female (AMNH); 6 mi. N. Cabo San Lucas, 21 July 1968, S. C. Williams, M. A. Cazier, and party, 2 males (CAS); 5 mi. N. Cabo San Lucas, 21 July 1968, S. C. Williams, M. A. Cazier, and party, 1 male, 1 female (CAS); 4 mi. N. Cabo San Lucas, 21 July 1968, S. C. Williams, M. A. Cazier, and party, 115 males, 13 females (CAS); 2 mi. N. Cabo San Lucas, 20 July 1968, S. C. Williams, M. A. Cazier, and party, 36 males, 2 females (CAS); Cabo San Lucas, west side, 19 July 1968, S. C. Williams, M. A. Cazier, and party, 2 males (CAS); Cabo San Lucas, 20 July 1968, S. C. Williams, M. A. Cazier, and party, 3 males, 3 females (CAS); Cabo San Lucas, 16 January 1959, H. B. Leech, 1 male (CAS).

Didymocentrus cerralvensis (Stahnke). New combination.
(Figures 10, 13, 14.)

Bioculus cerralvensis Stahnke, 1968, pp. 279 (key), 285-288, figs. 2-3.
Bioculus aguajensis Stahnke, 1968, pp. 280 (key), 281-283. New synonym.
Bioculus figghoblyni Stahnke, 1968, pp. 280 (key), 300-301. New synonym.
Bioculus parrishi Stahnke, 1968, pp. 280 (key), 308-311. New synonym.

DIAGNOSIS. Two pairs of lateral eyes; adults attain lengths over 55 mm.; spiniform setae on tarsomere II of walking legs 1 to 4 respectively number: $\frac{4\ 4}{4\ 4}$, $\frac{5\ 5}{5\ 5}$, $\frac{6\ 6}{6\ 6}$, $\frac{6\ 6}{6\ 6}$; pectine teeth 11 in males, 8 to 10 in females, (modes 11 in male, 9 in females); caudal segments with keels generally as in *Didymocentrus comondae* (Stahnke), the inferior laterals more reduced; hirsuteness of cauda as in *D. comondae.*

This species appears like a gigantic form of *D. comondae* from the Las Cruces area but can be easily distinguished by the formula of spiniform setae on tarsomere II, larger body size, and more slender metasomal segments. Females of this species with metasomal segment proportions (length to width) as follows: I - 0.97 to 1.2; II - 1.2 to 1.4; III - 1.3 to 1.5; IV - 1.6 to 1.9; V - 2.5 to 2.7. (See *D. comondae* for a diagnostic comparison).

TYPE DATA. Holotype, male, Isla Ceralbo [Cerralvo], Baja California Sur, Mexico, 21 March 1953, J. P. Figg-Hoblyn. Deposited in California Academy of Sciences, Type No. 9551.

GEOGRAPHIC DISTRIBUTION. Known only from Isla Cerralvo Baja California Sur, Mexico.

RECORDS. Known from the following records: Isla Cerralvo, BAJA CALIFORNIA SUR, MEXICO: Arroyo Aguaje, 15 April 1962, G. Lindsay, 2 females (holotype of *Bioculus aguajensis* and allotype of *B. parrishi*-CAS Type Nos. 9549 and 9559, respectively), 21 March 1953, J. P. Figg-Hoblyn, 1 male (holotype of *B. figghoblyni*-CAS Type No. 9555); Rancho Rufo, 16 April 1962, C. Parrish, 1 male (holotype of *B. parrishi*-CAS Type No. 9559); Piedras Gordas, 17 May 1970, S. C. Williams, V. F. Lee, 1 male, 6 females (CAS).

REMARKS. In his 1968 study, Stahnke examined a series of five diplocentrid specimens from Isla Cerralvo. From this material he erected four new species which he named *Bioculus cerralvensis*, *Bioculus aguajensis*, *Bioculus figghoblyni*, and *Bioculus parrishi*. His taxonomic interpretation of this series was difficult because: very few specimens were available for study, sexes were mixed, several specimens were juveniles, and preservation was poor. It now appears that only one species of *Didymocentrus* occurs on Isla

Cerralbo, *Didymocentrus cerralvensis*. This island population also appears to be very closely related to the *Didymocentrus comondae* population of the adjacent peninsula in color, structure, and habitat. However, the distinctness of the tarsal spine formulae and the size proportions of the metasomal segments indicate that this island population should be considered a separate species.

As a result of the study of additional material, three of the four species of '*Bioculus*' from Isla Cerralvo are here considered junior synonyms of *D. cerralvensis*. The criteria originally used to establish these species were found to reflect sexual dimorphism and differences of age. The holotype of *B. aguajensis* differs from the holotypes of *B. cerralvensis*, *B. figghoblyni*, and *B. parrishi* in that it is a female (and thus shows female characteristics). The holotypes of *B. figghoblyni* and *B. parrishi*, although of the same sex as the holotype of *B. cerralvensis*, are juveniles, and their distinguishing characteristics appear to be largely developmental.

Didymocentrus comondae (Stahnke). New combination.
(Figures 1-8, 11, 13, 14.)

Bioculus comondae Stahnke, 1968, pp. 280 (key), 288-289, 292-293.
Bioculus belvederi Stahnke, 1968, pp. 280 (key), 283-285. New synonym.
Bioculus danzantiensis Stahnke, 1968, pp. 280 (key), 297-300. New synonym.
Bioculus luteus Stahnke, 1968, pp. 280 (key), 304-306. New synonym.
Bioculus parraensis Stahnke, 1968, pp. 281 (key), 306-308; Stahnke, 1971, pp. 238-239. New synonym.
Bioculus santoensis Stahnke, 1968, pp. 280 (key), 313-315. New synonym.
Bioculus similis Stahnke, 1968, pp. 281 (key), 317-319. New synonym.

DIAGNOSIS. Two pairs of lateral eyes; adult not over 55 mm. long; tarsomere II spiniform setae formula: $\frac{3}{3}\,\frac{3}{3}$, $\frac{4}{4}\,\frac{4}{4}$, $\frac{5}{5}\,\frac{5}{5}$, $\frac{5}{5}\,\frac{5}{5}$; pectine teeth 9 to 11 in males, 7 to 9 in females, (modes 10 in males, 8 in females); color tawny to chocolate brown; keels on metasomal segments generally reduced to obsolete, dorsal keels never distinctly produced; dorsal keels on metasoma obsolescent or with a few tiny granules. Metasomal segments variable in length to width proportions among different populations; population from five miles southwest of La Paz as follows: males, I - 0.96 to 1.0, II - 1.0 to 1.1, III - 1.1 to 1.2, IV - 1.5, V - 2.0 to 2.1; females, I - 0.90 to 1.0, II - 1.0 to 1.2, III - 1.1 to 1.2, IV - 1.3 to 1.5, V - 1.9 to 2.0. Las Cruces series as follows: males, I - 1.1 to 1.2, II - 1.3 to 1.4, III - 1.4, IV - 1.7 to 1.8, V - 2.5 to 2.7; females, I-1.0, II - 1.1 to 1.2, III-1.2 to 1.3, IV - 1.5, V - 2.0 to 2.3. Populations on Islas del Espiritu Santo and Partida with more slender metasomal proportions than those from Las Cruces. Body size variable, adult males from five miles southwest of La Paz 34 to 43 mm., males from Islas Partida and Espiritu Santo 42 to 48 mm.

TYPE DATA. Holotype (male) and allotype (female), from Comondu, Baja California Sur, Mexico, E. S. Ross and A. E. Michelbacher. Deposited in the California Academy of Sciences, Type No. 9552.

GEOGRAPHIC DISTRIBUTION. Most widely distributed diplocentrid of Baja California Sur. Ranges from near San Ignacio to near Antonio (27°21' to 23°48' N.). Also occurs on Islas Danzante, San Jose, San Francisco, Partida, and Espiritu Santo.

RECORDS. Known from the following localities in BAJA CALIFORNIA SUR, MEXICO: 5 mi. N. San Ignacio (mission), 20 January 1965, V. Roth, chelae only (AMNH); Mulege, 26 January 1965, V. Roth, 1 female (AMNH); Bahia Concepcion, near El Coyote, 17 February 1966, V. Roth (AMNH); Parras Canyon, top of grade above Parras Ranch, G. Lindsay, 1 female, (holotype of *B. parraensis*-CAS, Type No. 9558); 4 mi. S. Mission San Javier, 18 May 1969, S. C. Williams, 1 female (CAS); 75 mi. NW. La Paz, 4 July 1968, S. C. Williams, M. A. Cazier, and party, 1 male, 1 female (CAS); near ocean beach, 2 mi. E. El Coyote, NE. La Paz, 30 December 1958, H. B. Leech, 2 immatures (CAS); Las Cruces, 29 July 1968, S. C. Williams, M. A. Cazier, M. M. Bentzien, J. Davidson, J. Bigelow, 64 males, 7 females (CAS); Las Cruces, 30 July 1968, S. C. Williams, 1 female with 10 juveniles (CAS); 0 to 5 mi. SW. Las Cruces, 30 July 1968, S. C. Williams, M. A. Cazier, M. M. Bentzien, J. Bigelow, 31 females (CAS); 14 mi. NE. La Paz along Balandra Road, 9 July 1968, S. C. Williams, M. A. Cazier, and party, 4 males (CAS); 14 mi. NE. La Paz along Balandra Road, 10 July 1968, M. A. Cazier, J. Davidson, J. Bigelow, 3 males (CAS); 14 mi. NE. La Paz along Balandra Road, 14 July 1968, S. C. Williams, M. A. Cazier, and party, 3 males (CAS); 9.6 mi. E. La Paz, Rancho Santa Victoria, 30 December 1958, I. Wiggins, 1 male, 1 female (CAS); 9 mi. E. La Paz on road to Las Cruces, 23 December 1958, H. B. Leech, 3 females, 6 immatures (CAS); 2 mi. E. La Paz, 5 July 1968, S. C. Williams, M. A. Cazier, and party, 1 female (CAS); La Paz, 5 January 1959, H. B. Leech, 1 male (CAS); La Paz, 1-3 February 1965, V. Roth, 2 females (AMNH); La Paz, 2-3 February 1966, V. Roth, 1 male, 1 female (AMNH); La Paz, 31 July 1968, 1 adult (CAS); 1 mi. S. La Paz, 6 July 1968, S. C. Williams, M. A. Cazier, and party, 3 males, 1 female (CAS); 5 mi. SW. La Paz, 31 July 1968, S. C. Williams, M. M. Bentzien, 290 males, 21 females (CAS); 5 mi. SW. La Paz, 1 August 1968, S. C. Williams, M. M. Bentzien, M. A. Cazier, 501 males, 31 females (CAS); 5 mi. SW. La Paz, 2 August 1968, S. C. Williams, M. A. Cazier, M. M. Bentzien, J. Bigelow, 526 males, 45 females (CAS); 5 mi. SW. La Paz, 3 August 1968, S. C. Williams, M. A. Cazier, and party, 235 males, 32 females (CAS); 5 mi. SW. La Paz, 24 April 1969, S. C. Williams, 2 females (CAS); 5 to 6 mi. SW. La Paz, 5 July 1968, S. C. Williams, M. A. Cazier, and party, 134 males, 9 females (CAS); 5 to 6 mi. SW. La Paz, 6 July 1968, S. C. Williams, M. A. Cazier, and party, 61 males, 8 females (CAS); Cactus Garden, 1 mi. E. Los Aripes, 8 July 1968, M. A. Cazier, J. Bigelow, N. Leppla, 98 males, 17 females, 6 first instars (CAS); Los Aripes, 10 mi. W. La Paz, 6 July 1968, S. C. Williams, M. A. Cazier, and party, 3 males (CAS); El Triunfo, 3 February 1965, V. Roth, 1 male (AMNH); 2.9 mi. SW. San Antonio, 24 July 1968, S. C. Williams, M. M. Bentzien, 1 male (CAS); 10 mi. SW. San Jose del Cabo (questionable locality accuracy), 9 July 1938, E. S. Ross, A. E. Michelbacher, 1 male (holotype of *B. similis*-CAS, Type No. 9562). ISLANDS IN THE GULF OF CALIFORNIA: Isla Danzante, 7 April 1962, members of the Belvedere Expedition, 1 male (allotype of *B. belvederi*-CAS, Type No. 9550), 2 females (holotypes of *B. belvederi* and *B. danzantiensis*-CAS, Type Nos. 9550 and 9554 respectively); Isla Danzante, northwest side, 23 May 1970, S. C. Williams, V. F. Lee, 6 females (CAS); Isla San Jose, northeast side, Arroyo de Aguado, 11 April 1962, Belvedere Expedition, 1 female (CAS); Isla San Jose, Bahia Amortajada, Salinas, 25 March 1971, V. F. Lee, 1 female (CAS); Isla San Francisco, southeast side, 17 April 1962, C. Parrish, 1 female (holotype of *B. luteus*-CAS, Type No. 9557); Isla San Francisco, south side, 18 May 1970, S. C. Williams, V. F. Lee, 1 female (CAS); Isla San Francisco, east end San Francisco Bay, 11 June 1971, K. Lucas, 1 male (CAS); Isla Partida, central valley, 9 July 1968, S. C. Williams, M. M. Bentzien, W. K. Fox, 3 males (CAS); Isla Partida, central valley, 10 July 1968, S. C. Williams, M. M. Bentzien, W. K. Fox, 2 males, 1 female (CAS); Isla Partida, south shore, 8 July 1968, W. K. Fox, M. M. Bentzien, 1 male (CAS); Isla del Espiritu Santo, 23 March 1953, J. P. Figg-Hoblyn, 1 male (holotype of *B. santoensis*-CAS, Type No. 9561); Isla Espiritu Santo, north shore, 8 July 1968, S. C. Williams, W. K. Fox, M. M. Bentzien, 4 males (CAS); Isla Espiritu Santo, southwest shore, 7 July 1968, S. C. Williams, M. M. Bentzien, W. K. Fox, 2 males, 1 female (CAS); Isla del Espiritu Santo, 4 August 1971, K. Lucas, 1 male (CAS).

REMARKS. Six species of diplocentrid scorpions named from Baja California Sur are here considered junior synonyms of *D. comondae*. The types of *Bioculus belvederi* Stahnke, *B. parraensis* Stahnke, *B. santoensis* Stahnke are juveniles. The holotype of *B. danzantiensis* Stahnke appears to be a subadult female. *Bioculus luteus* appears to be a light color phase of *D. comondae* and is structurally similar to *D. comondae.* The specimens from Islas San Jose and San Francisco listed above are similar to the holotype of *B. luteus* in having lighter pigmentation. These individuals may possibly be accorded infraspecific rank, but until additional evidence in support of this is available, *B. luteus* should be considered synonymous with *D. comondae.*

Didymocentrus cruzensis (Stahnke). New combination.
(Figures 12, 13, 14.)

Bioculus cruzensis Stahnke, 1968, pp. 280 (key), 293-297.
Bioculus lindsayi Stahnke, 1968, pp. 281 (key), 301-304.
New synonym.
Bioculus prolatio Stahnke, 1968, pp. 280 (key), 311-313.
New synonym.

DIAGNOSIS. Two pairs of lateral eyes; adults over 55 mm. long; tarsomere II spiniform setae formula: $\frac{3}{3}\,\frac{3}{3}$, $\frac{4}{4}\,\frac{4}{4}$, $\frac{5}{5}\,\frac{5}{5}$, $\frac{5}{5}\,\frac{5}{5}$ on walking legs 1 to 4 respectively; pectine teeth 9 to 10 in males, 8 to 9 in females. Metasomal segments with more prominent granules along keels than on other species in group, granules on dorsal keels few, coarse, well spaced, forming line on segments I to IV, never incomplete, more or less equally developed on these segments; dorsolateral keels less prominent but distinguishable; segment V with prominent dorsolateral keels, laterals as ridge, inferior laterals and inferior medians with prominent well spaced, coarse triangular granules.

TYPE DATA. *Bioculus cruzensis* Stahnke, holotype, male, from Isla Santa Cruz, Baja California Sur, Mexico, 26 March 1953, J. P. Figg-Hoblyn. Deposited in the California Academy of Sciences, Type No. 9553.

GEOGRAPHIC DISTRIBUTION. Known only from Isla Santa Cruz, Baja California Sur, Mexico.

RECORDS. Known only from Isla Santa Cruz, BAJA CALIFORNIA SUR, MEXICO: southwest side, 18 April 1962, G. Lindsay, 1 female (holotype of *B. lindsayi*-CAS, Type No. 9556); 26 March 1953, J. P. Figg-Hoblyn, 1 female (holotype of *B. prolatio*-CAS, Type No. 9560).

REMARKS. *Bioculus lindsayi* and *B. prolatio* are here synonymized because the holotypes appear to be juvenile females of *B. cruzensis.* The distinctive dorsal and dorsolateral keels are present on the juveniles as well as on the adult.

Key to Baja Californian Diplocentridae: Genus DIDYMOCENTRUS

1. Three pairs of lateral eyes (figure 14a)...............
   .... *D. caboensis* Stahnke
   Two pairs of lateral eyes (figure 14b)................2

2. Last tarsomere with basic spiniform setae formula $\frac{4}{4}\ \frac{4}{4}$, $\frac{5}{5}\ \frac{5}{5}$, $\frac{6}{6}\ \frac{6}{6}$, $\frac{6}{6}\ \frac{6}{6}$ on walking legs 1 to 4 respectively
   (figs. 14c, e); Isla Cerralvo.......................
   ....*D. cerralvensis* (Stahnke)
   Last tarsomere with basic spiniform setae formula $\frac{3}{3}\ \frac{3}{3}$, $\frac{4}{4}\ \frac{4}{4}$, $\frac{5}{5}\ \frac{5}{5}$, $\frac{5}{5}\ \frac{5}{5}$ on walking legs 1 to 4 respectively
   (figs. 14d, f) 3

3. Keels of caudal segments prominent, granulations strongly serrate (figure 14h); Isla Santa Cruz...........
   ....*D. cruzensis* (Stahnke)
   Keels not prominent, usually with at most only a few small granules (figure 14g)....*D. comondae* (Stahnke)

Discussion and Conclusions

Comparison of the morphology of the Baja California diplocentrids indicates that the four species are very closely related. The Baja California species appear derived from ancestors with 8 ocelli although today only one species, *D. caboensis*, still clearly shows this basic characteristic. The remaining three species appear to be derived directly from the eight eyed form by secondary reduction and loss of the third pair of lateral ocelli. Evidence for this is the rare appearance of a third lateral ocellus on *D. comondae*. When this third ocellus does occur, it is greatly reduced in size, inconspicuous, and sometimes not found on both sides of the carapace. Such a reduction in the number of lateral ocelli has been reported in some North American members of Vaejovidae recently by Gertsch and Soleglad (1972).

The reduction in lateral ocellus number from three to two pairs and the apparent speciation among the Baja California *Didymocentrus* must have been fairly recent judging from the striking morphological similarity among the four recognized species. The two insular species, *D. cruzensis* and *D. cerralvensis* appear to have been more recently derived from the *D. comondae* stock by insular isolation on their respective islands. This is evidenced by their striking similarity in morphology to the present *D. comondae* populations which occur in the adjacent peninsular habitats.

The morphological characters that have been most sensitive to differential natural selection (and thus are here used as taxonomic characters) are the number of lateral ocelli, the number of spiniform setae arranged in rows on the tarsomere of each walking leg, the degree of granulation of the metasomal keels, the length to width ratios of the metasomal segments, and the hirsuteness of the metasoma. Many of the characteristics previously used in the diagnoses of the Baja California diplocentrids have been found unreliable for species determination because of variation induced by sexual dimorphism, developmental stage differences, individual differences, and unavoidable measurement or observational error. These sources of variability resulted in character ranges that tended to overlap when the species were compared. One character considered important in species determination prior to this study was the geometry of the triangles that could be visualized between specified trichobothria on the pedipalps (Stahnke, 1968). This character was found difficult to apply because slight changes in the perspective of the observer caused significant changes in the apparent geometry of such triangles.

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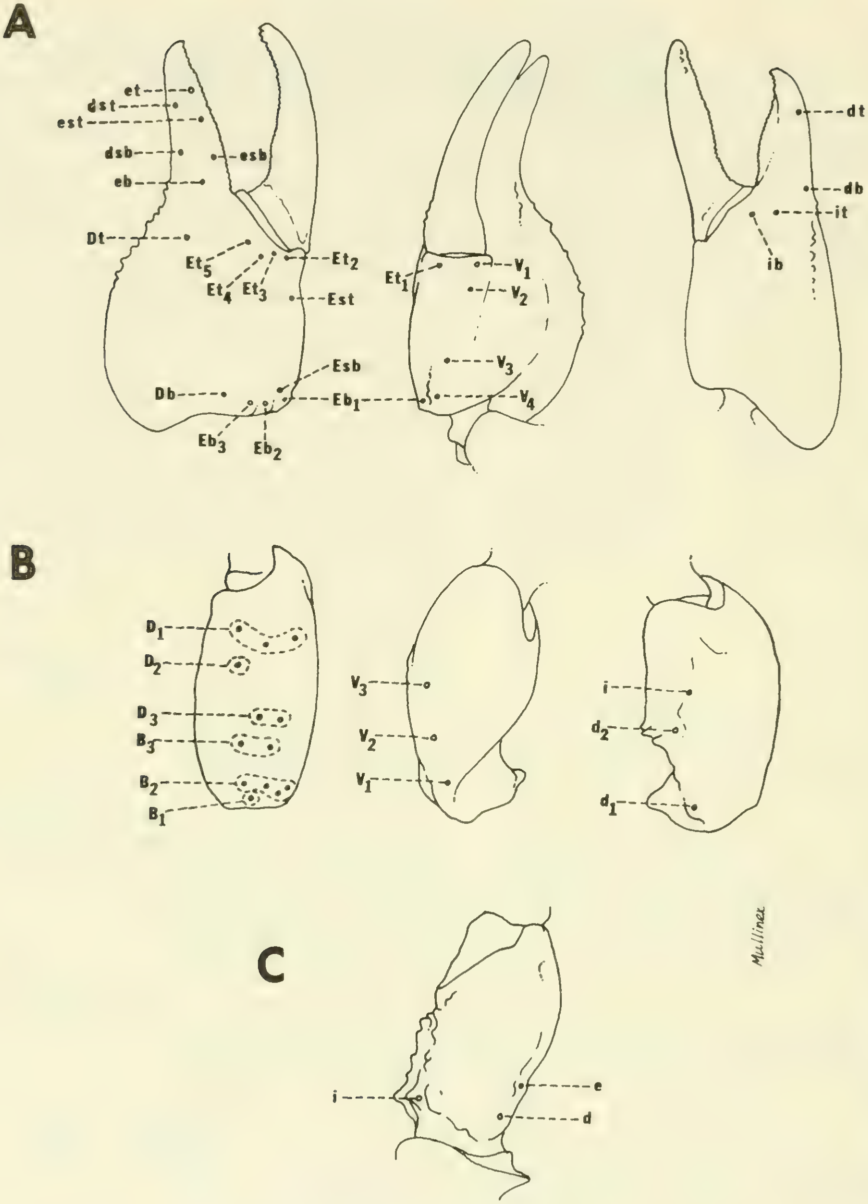

FIGURE 1. Pedipalp trichobothrial arrangement on *Didymocentrus* from Baja California. A. Chela, B. Brachium, C. Humerus. Figured from a specimen of *D. comondae* collected five miles northwest of La Paz, Baja California Sur, Mexico.

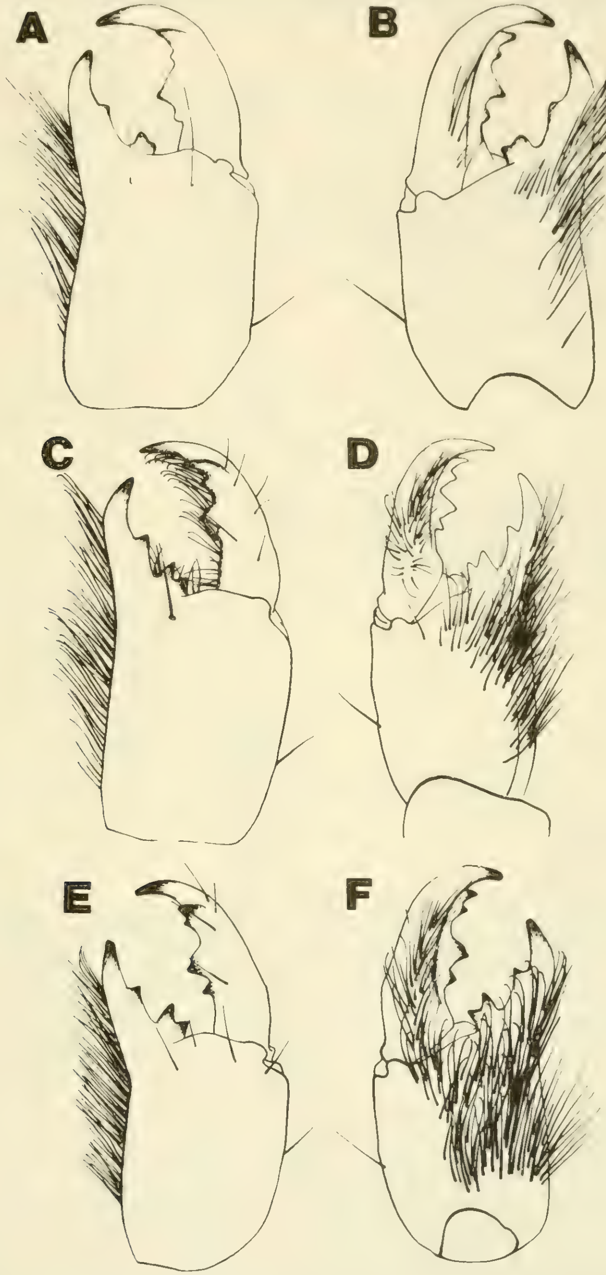

FIGURE 2. Comparison of cheliceral structure of *Didymocentrus antillanus*, male (From St. Lucia, West Indies), *Diplocentrus bigbendensis*, male (Big Bend National Park), and *Didymocentrus comondae*, male (La Paz, Baja California Sur). a. *D. comondae*, dorsal view; b. *D. comondae*, ventral view; c. *D. antillanus*, dorsal view; d. *D. antillanus*, ventral view; e. *D. bigbendensis*, dorsal view; f. *D. bigbendensis*, ventral view. Note similarity in basic structure of the chelicerae of *Diplocentrus* and *Didymocentrus*. The more rounded denticles on the specimen of *D. comondae* are probably due to wear.

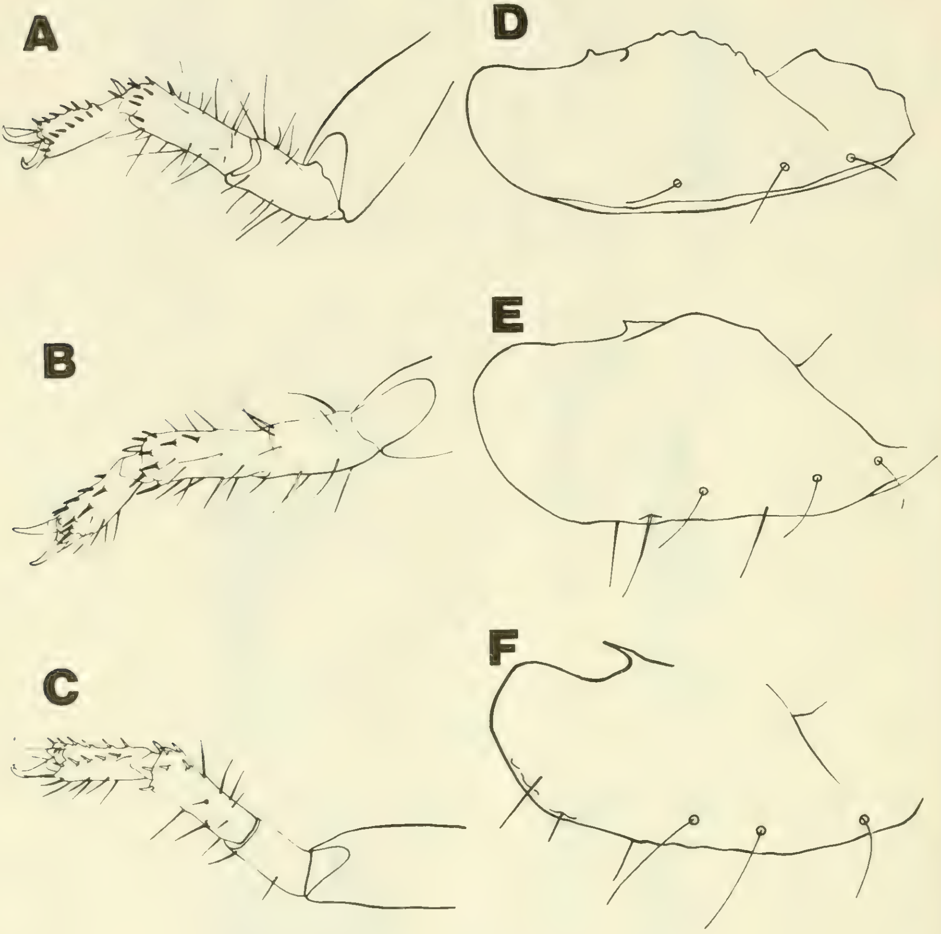

FIGURE 3. Comparisons of the structure of tarsomeres of the fourth walking leg and the ventral aspect of the pedipalp brachium of *Didymocentrus antillanus* (St. Lucia), *Diplocentrus bigbendensis* (Big Bend National Park), and *Didymocentrus comondae* (La Paz). A,D. *Diplocentrus bigbendensis*; B,E. *Didymocentrus comondae*; C,F. *Didymocentrus antillanus*. Note arrangement of spiniform setae into two rows on last tarsomere and similarity of basic setation pattern for both genera. Note also the similarity of trichobothrial numbers and arrangement on ventral aspect of brachium in both genera.

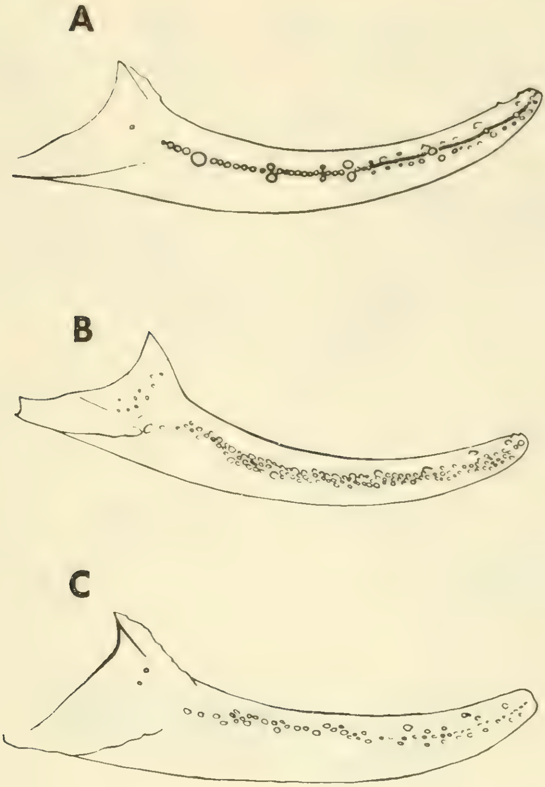

FIGURE 4. Comparison of the denticles of the movable pedipalp finger between *Diplocentrus* and *Didymocentrus*. a. *Diplocentrus bigbendensis*, male (Big Bend National Park); b. *Didymocentrus antillanus*, male (St. Lucia); c. *Didymocentrus comondae*, male (La Paz). Note the tendency toward more ordered denticle arrangement in *D. bigbendensis* and the more intermediate condition in *D. comondae*.

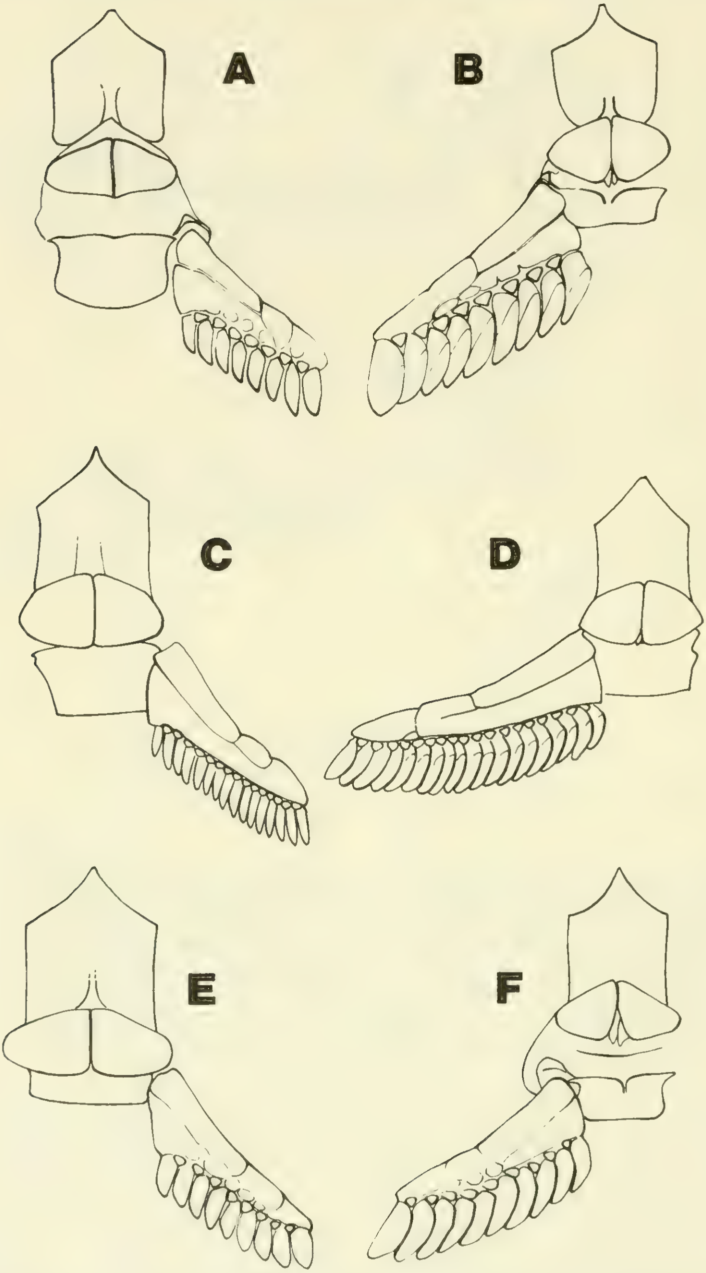

FIGURE 5. Comparisons of the structure of pectines and genital papillae of *Diplocentrus* and *Didymocentrus*. a. *D. antillanus*, male (St. Lucia); b. *Didymocentrus antillanus*, female; c. *Diplocentrus bigbendensis*, male (Big Bend National Park); d. *Diplocentrus bigbendensis*, female; e. *Didymocentrus comondae*, male (La Paz); f. *Didymocentrus comondae*, female. Note similarity of basic structures in all three species and that males have distinct genital papillae.

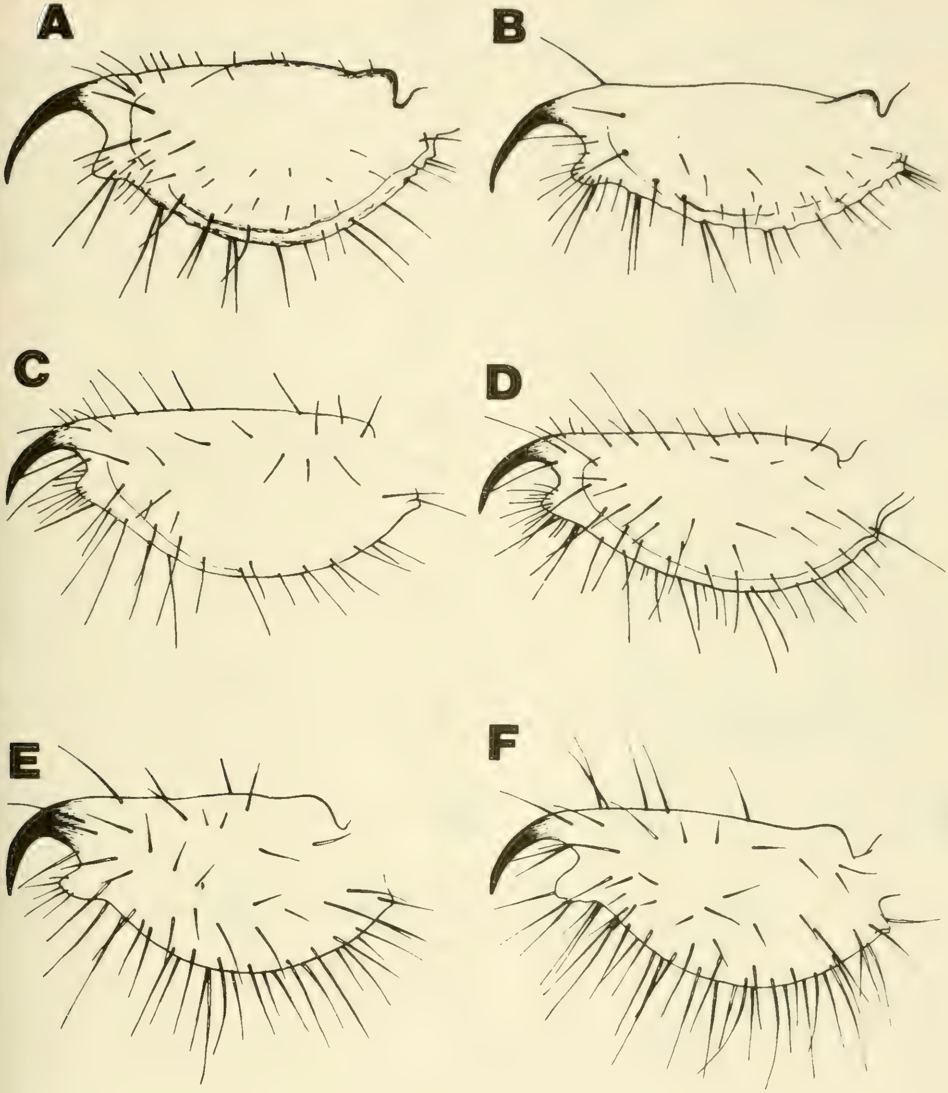

FIGURE 6. Comparison of the telson structure of *Diplocentrus* and *Didymocentrus*. a. *Didymocentrus antillanus*, male (St. Lucia); b. *Didymocentrus antillanus*, female; c. *Diplocentrus bigbendensis*, male (Big Bend National Park); d. *Diplocentrus bigbendensis*, female; e. *Didymocentrus comondae*, male (La Paz); f. *Didymocentrus comondae*, female.

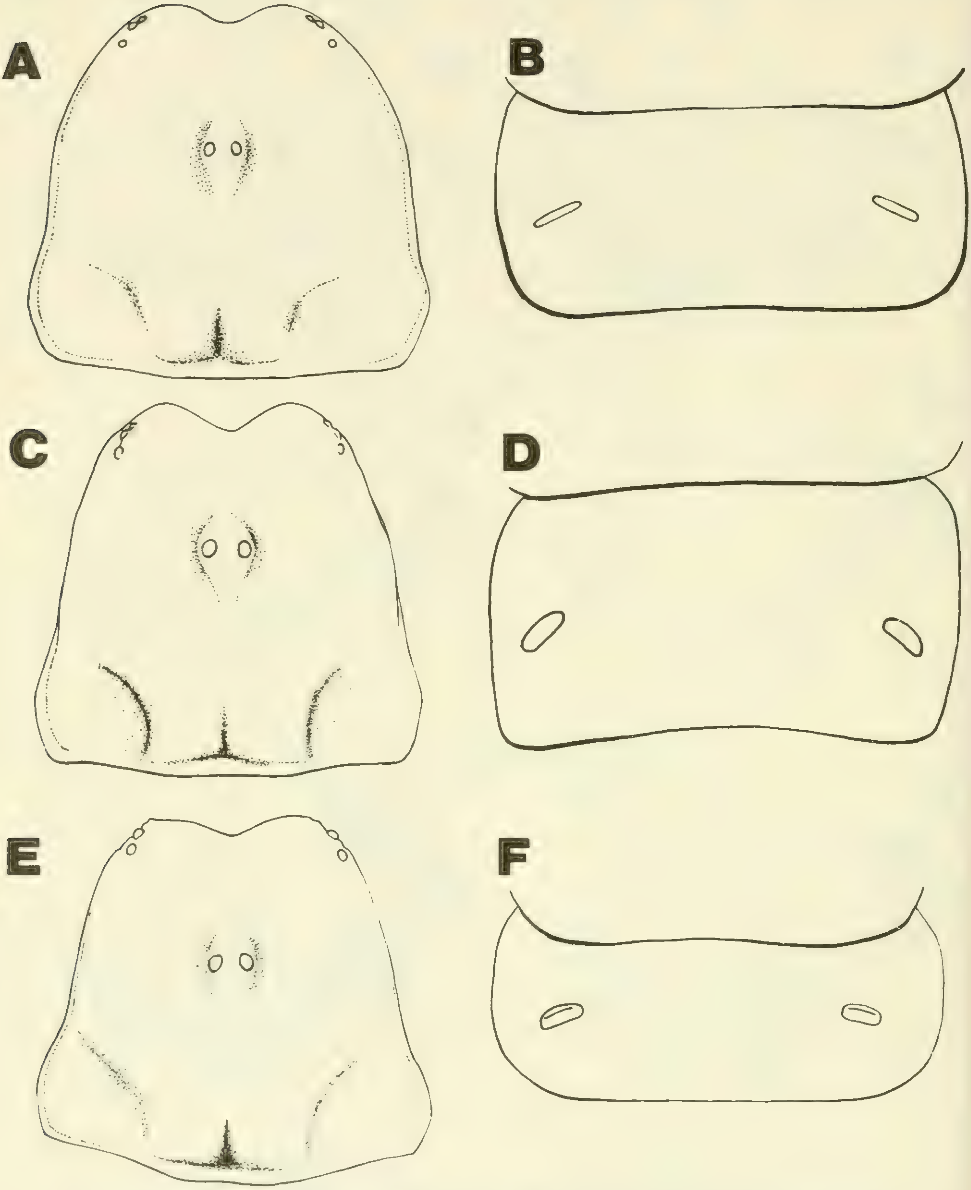

FIGURE 7. Comparisons of the structure of carapace and book lung openings of *Diplocentrus* and *Didymocentrus*. a. *Diplocentrus bigbendensis*, male (Big Bend National Park); b. *Diplocentrus bigbendensis*, female; c. *Didymocentrus antillanus*, male (St. Lucia); d. *Didymocentrus antillanus, female; e. Didymocentrus comondae*, male (La Paz); f. *Didymocentrus comondae*, female. Note the distinctive six eyed condition of *D. comondae* (representing the Bioculus group) in contrast to the more basic eight eyed condition of *D. bigbendensis* and *D. antillanus*.

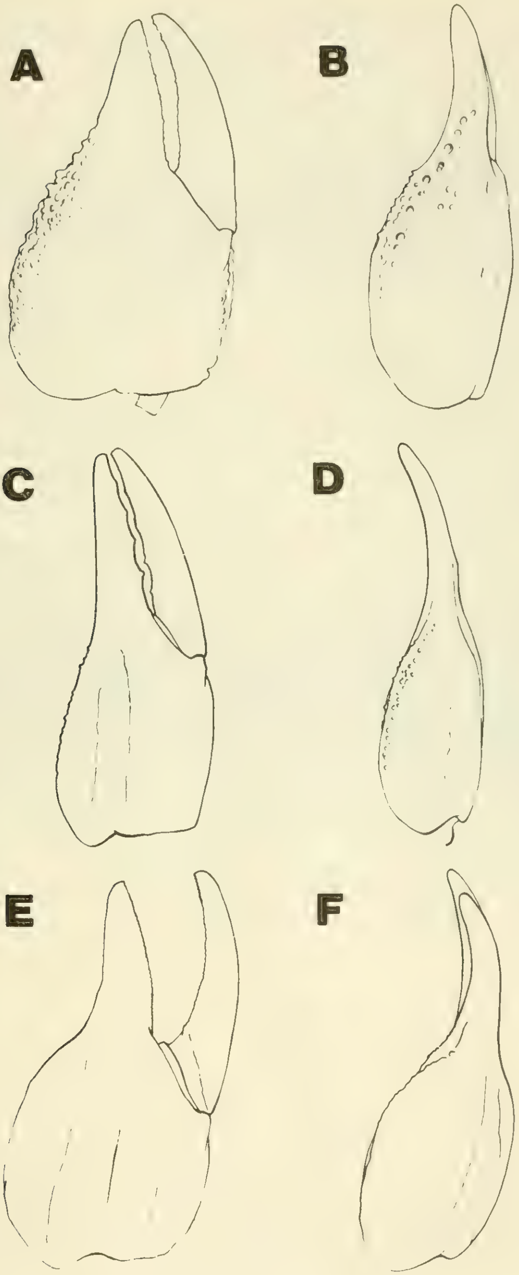

FIGURE 8. Comparisons of the structure of the pedipalp chela (dorsal and lateral views) of *Diplocentrus* and *Didymocentrus* males. a-b. *Didymocentrus comondae* (La Paz); c-d. *Diplocentrus bigbendensis* (Big Bend National Park); e-f. *Didymocentrus antillanus* (St. Lucia).

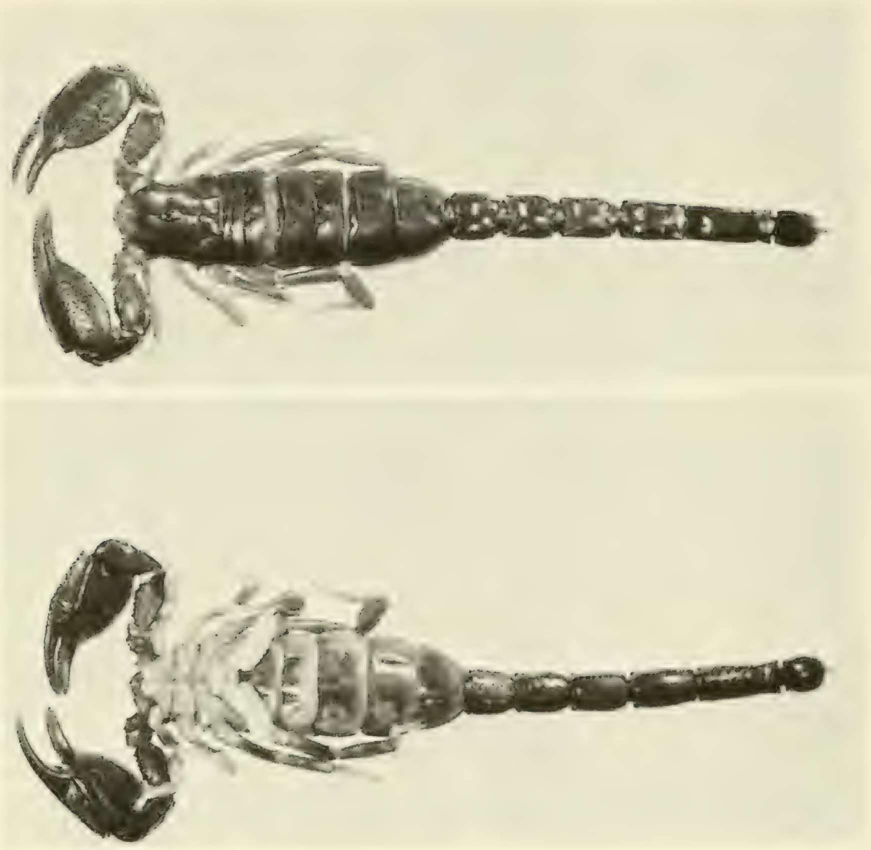

FIGURE 9. *Didymocentrus caboensis* Stahnke, male, from Cabo San Lucas. Dorsal and ventral view.

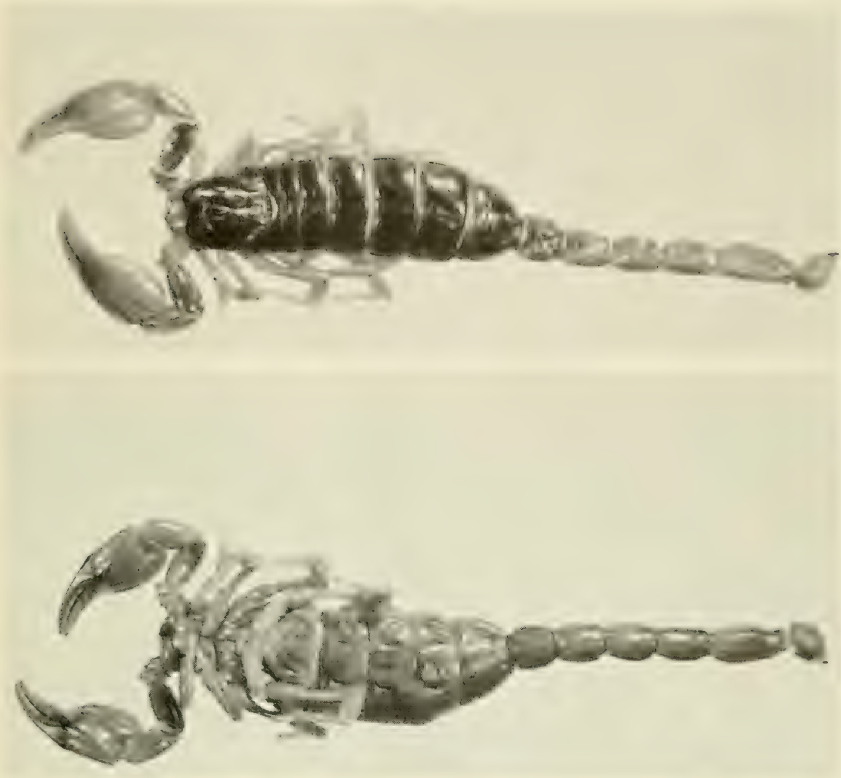

FIGURE 10. *Didymocentrus cerralvensis* (Stahnke), male, from Isla Cerralvo, Baja California Sur. Dorsal and ventral view.

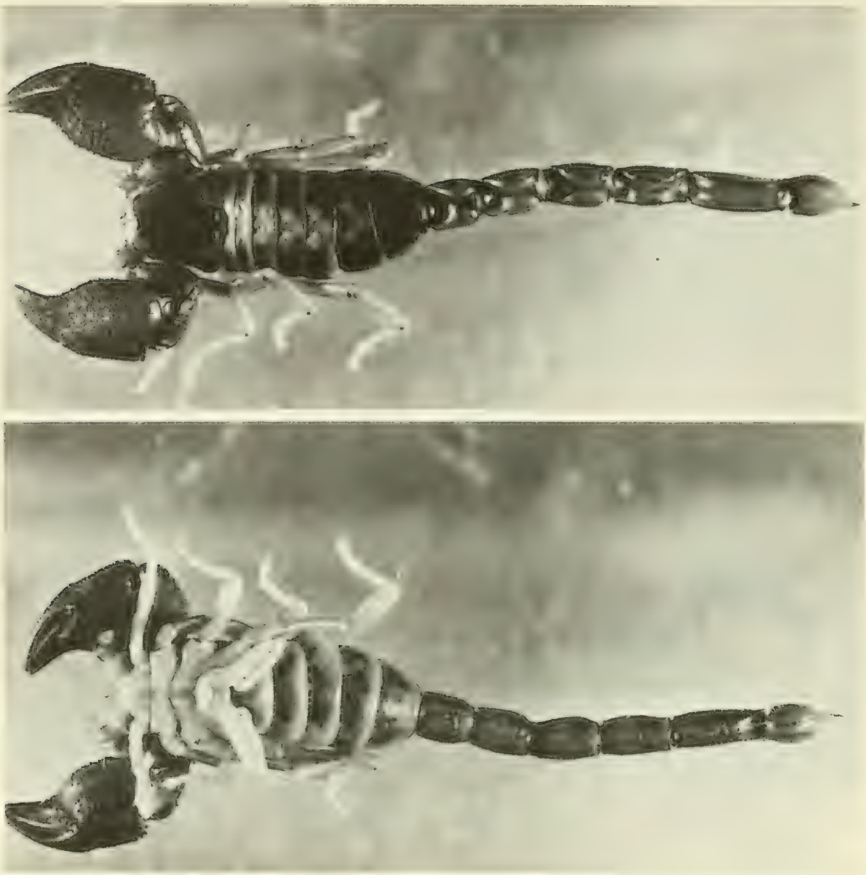

FIGURE 11. *Didymocentrus comondae* (Stahnke), male, from five miles southwest of La Paz, Baja California, Mexico. Dorsal and ventral view.

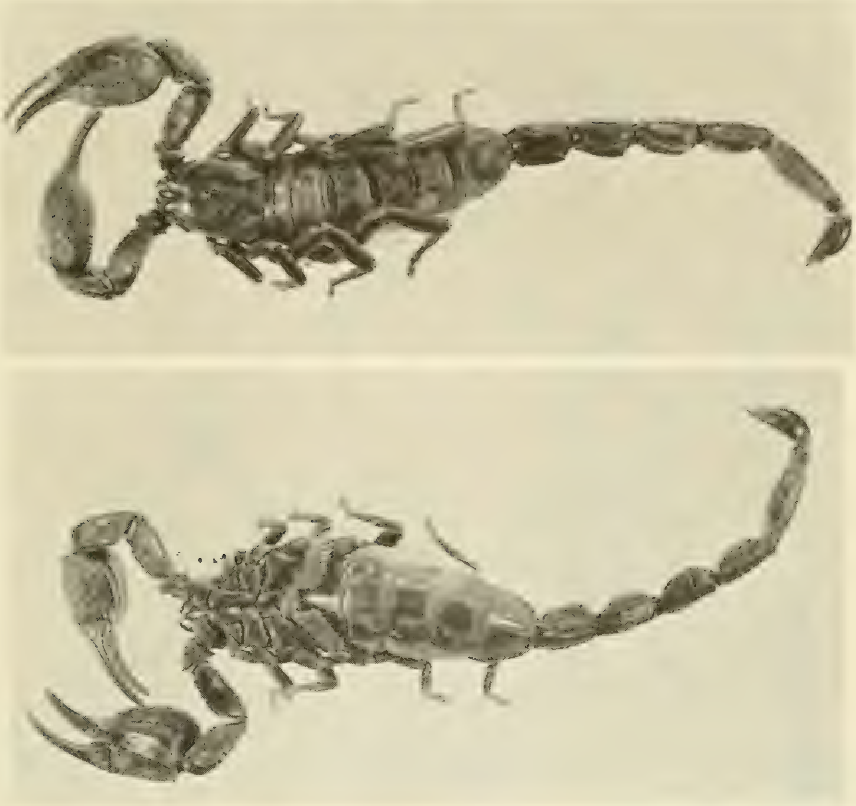

FIGURE 12. *Didymocentrus cruzensis* (Stahnke), holotype, male, from Isla Santa Cruz, Baja California Sur, Mexico. Dorsal and ventral view.

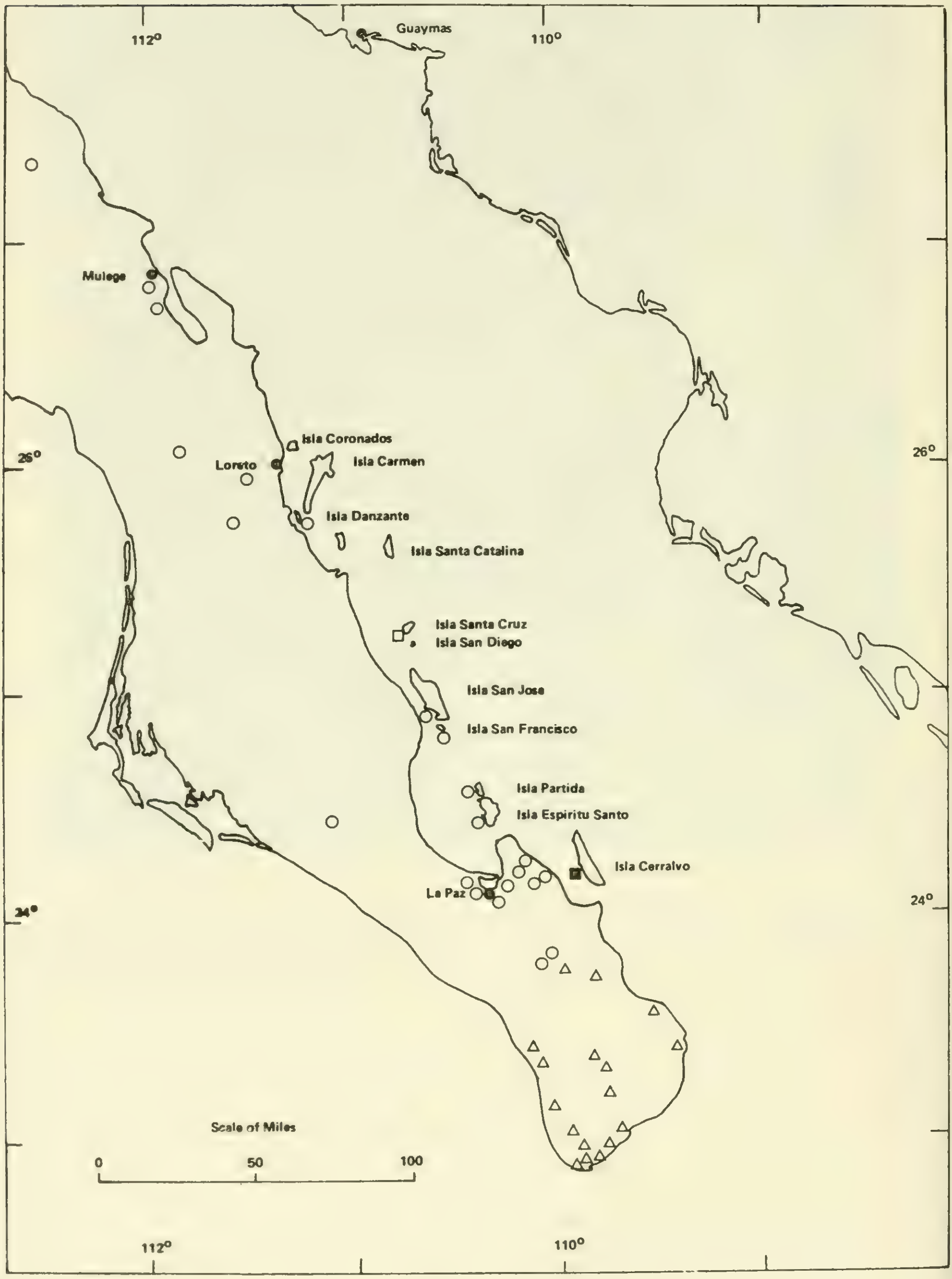

FIGURE 13. Distribution of the species of Diplocentridae occurring in Baja California, Mexico. O - *Didymocentrus comondae*, △ - *Didymocentrus caboensis*, ■ - *Didymocentrus cerralvensis*, □ - *Didymocentrus cruzensis*.

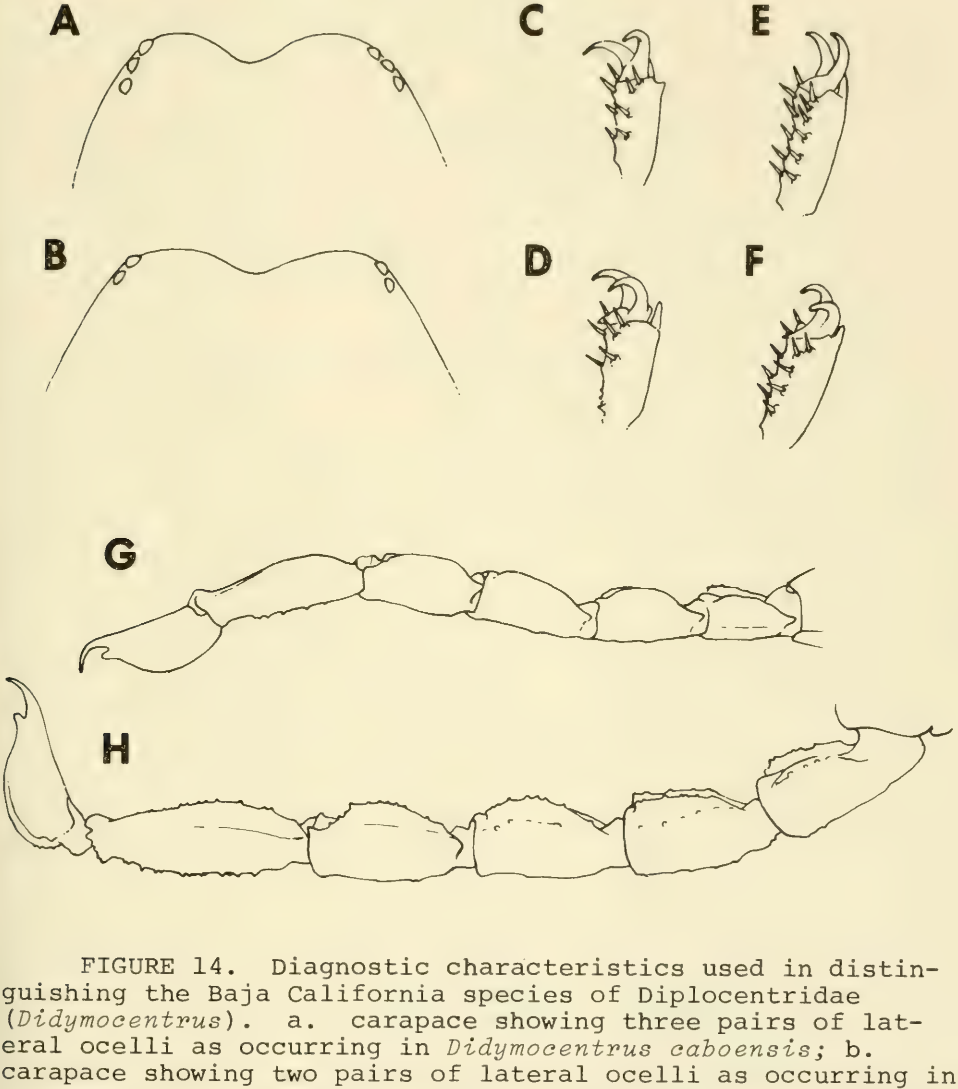

FIGURE 14. Diagnostic characteristics used in distinguishing the Baja California species of Diplocentridae (*Didymocentrus*). a. carapace showing three pairs of lateral ocelli as occurring in *Didymocentrus caboensis;* b. carapace showing two pairs of lateral ocelli as occurring in *D. comondae, D. cruzensis,* and *D. cerralvensis;* c-d. last tarsomere of first pair of walking legs; e-f. last tarsomere of fourth pair of walking legs; g-h. metasoma and telson, lateral view showing mature dorsal keels.

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